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Lipofilling and PRP for aesthetic facial rejuvenation

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II

LIPOFILLING IN MACS LIFTING ENHANCES REJUVENATION

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Introduction

Loss of volume seems an important aspect in facial aging, at the same time its relevance is frequently neglected. In this study, we investigated the relevance of lipofilling as an ancillary procedure to improve the impact of a facelifting procedure.

Results

MACS-lifting combined with lipofilling yielded overall cosmetic results that were significantly better than results obtained by MACS-lifting alone. The photographic evaluations showed that improvements were more pronounced in the tear trough ($p < 0.05$) and malar eminence ($p < 0.01$) than in the nasolabial groove ($p > 0.05$).

Material and Methods

A retrospective analysis of a cohort of 50 cases of MACS lifting (Minimal Access Cranial Suspension) versus 42 cases of MACS lifting with adjuvant lipofilling was performed. Results were evaluated using a photographic ranking system by two different panels (five plastic surgeons and five medical students).

Conclusion

Volume restoration with lipofilling, following MACS-lifting, produces significantly better postoperative results than MACS-lifting alone. The most pronounced improvements are seen in the region of the tear trough and malar eminence.

Introduction

To obtain the most natural appearing rejuvenation of the ageing face, it is becoming increasingly accepted that lifting alone is not sufficient in the majority of cases¹⁻⁶. Important factors resulting in ageing of the face are: the effect of gravity, the loss of skin elasticity (due to collagen degradation) and the loss of volume (due to fat atrophy⁷⁻⁹ and bone resorption^{10,11}. Especially the loss of volume is nowadays seen as a major factor in aging of the face¹². Repositioning the soft tissue along a vertical vector has been demonstrated to rejuvenate the face in an aesthetically pleasing manner^{5,7,13,14}. Our aim was to investigate the relevance of lipofilling, also commonly referred to as autologous microfat grafting, as an ancillary procedure to augment the results in short scar vertical vector face lifting. All patients included in this study received vertical repositioning by a Minimal Access Cranial Suspension (MACS) lift^{15,16}.

Patients and Methods

Surgical technique

MACS lifting was undertaken as described by Tonnard and Verpaele^{15,16}, with minor modifications only. A curved pre-trageal incision was used, running vertically upward into the sideburn. Subcutaneous dissection was extended to the anterior border of the parotid gland, extended 4 cm under the angle of the mandibule, revealing the Platysma muscle clearly. One cm cranial to the helical root, a pretragal purse-string suture was anchored to the deep temporalis fascia. Incorporating the SMAS overlying the parotid gland the first purse-string suture runs inferiorly in a narrow U-shape well beyond the angle of the mandible including the Platysma muscle firmly, before returning to the starting point 1 cm anterior to the first leg of the suture. This most caudal point of the suture loop was placed lower than initially described to enable a more pronounced effect in flattening the floor of the mouth by a pulley-effect over the mandible when lifting the Platysma muscle vertically. The second purse-string suture was more O-shaped. It was placed from the same starting point but directed to the extent of the subcutaneous dissection. The entire procedure is also clarified in video on www.surgytec.com (<http://www.surgytec.com/video/xmacs-lifting-7-tips-to-reduce-operating-time-and-improve-results>).

In cases where loss of volume was a clear part of the ageing process, lipofilling was performed, either during the MACS-lift or within 1 year after initial surgery. The Coleman technique^{9,17} for fat harvesting and injection was used but refined by using a smaller custom made canula for harvesting (inner diameter 1.3 mm). Donor sites were the abdomen and the upper legs in all patients. The upper legs were the preferred donor site for harvesting for practical reasons. In female clients the upper legs proved to yield consistent quantities of high quality fat, that could be removed with minimal trauma to the graft and minimal discomfort to the patient. The abdomen yielded less consistent quantities of usable fat compared to the upper legs, particularly in thinner patients. In those cases the percentage of disrupted fat cells leaving a larger oily fraction after centrifugation was higher. Approximately 2-3 times more fat was harvested than the estimated amount required for the procedure. Fat was centrifuged for 3 minutes at the maximum speed of 3000RPM (IEC MediSpin Centriguge), after which the oil (top layer) and serum/infiltrate layers (bottom layer) were drained away, preserving the pre-adipocyte-rich pellet¹⁸. Fat injection was performed using a short curved Coleman canula in 1mm aliquots. Between 13 to 23 cc of fat was injected in the deep subcutaneous plane in each side of the face, except for the lower lid/tear trough region, where the injection was performed in the supraperiosteal/submuscular plane and the temporal area were the level of injection

was above the superficial fascia of the Temporal muscle. Lipofilling could be performed in conjunction with a MACS lift without difficulties as the target zones for injection were outside of the MACS-lift dissection area.



Figure I. Examples of photographs presented to panel members for photo ranking analysis. A: anterior-posterior view, B: three-quarter view.

Patient groups & evaluation of results

After initial experience with 200 MACS liftings between 2000 and 2006, a study evaluating the effect of adding lipofilling to the MACS lift was started from 2006 onwards. Subsequently, two groups were defined; group A (n=50): patients with MACS lifting only; group B (n=42): patients treated with MACS-lifting with adjuvant lipofilling, performed simultaneously or within one year after MACS-lifting. A minimal follow-up period of 6 months, without any other facial surgical procedure during that time, was required for inclusion. Groups did not differ significantly in age, smoking behavior or body mass index. The senior author, with extensive experience in facial cosmetic surgery and lipofilling prior to the trial, performed surgery in both groups. All patients receiving a MACS lifting were treated using exactly the same technique as described above.

From each of the two groups (50 cases in Group A and 42 in Group B), pre- and postoperative photographs were obtained from 16 patients, randomly selected by an independent statistician, making two times two sets of 8 photos to be analyzed. Each set of 8 photos was holding 4 cases from group A and 4 cases from group B. Two panels were asked in a single-blinded fashion, to evaluate frontal and three-quarter view of pre- and postoperative photographs for every patient (see Figure I). No patient information was provided. One panel consisted of five plastic surgeons, the other of five medical students. Individual panel member were asked to assess

improvement of the pre- versus postoperative photo per case presented and rank the results by placing the photos in a row on a table from best to least improvement. Each ranked photo received a score ranging from 8 (for the best improvement) to 1 (for the least improvement). Three different aesthetic zones in the face were evaluated - Zone 1 represented the tear trough / nasojugal groove; Zone 2 the nasolabial crease and Zone 3 the malar eminence (Figure II).

Statistical analyses

Scores derived from ranking the photographs were summed and grouped according to the view and aesthetic zone (see Table I). Statistical comparisons were performed using a student-t test. All data analysis was performed with the SPSS statistical package (version 16.02 for Windows, SPSS Inc, Chicago, IL).

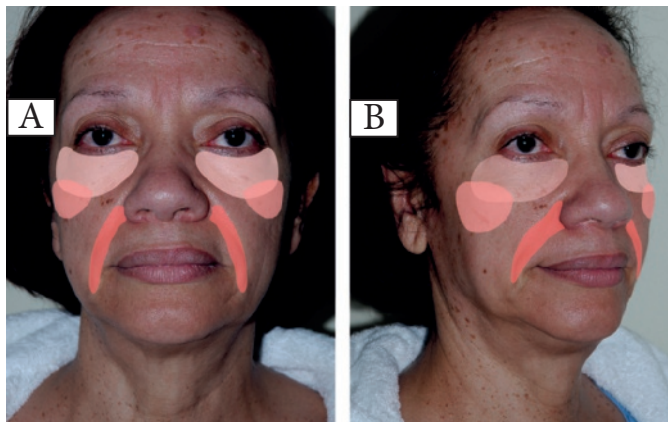


Figure II. Shaded areas represent the different zones that were targeted for evaluation in our study. Zone 1(lightest color) represents the tear trough/nasojugal groove, zone 2 (darkest color) represents the nasolabial crease, zone 3 represents the malar eminence (intermediate color).

A: anterior-posterior view, B: three-quarter view.

All patients in Group B received lipofilling in these areas.

Results

Results from the photographic comparisons

Mean follow-up in both groups was comparable (>12 months, ranging from 6 – 46 months). Mean age on the day of surgery was 50.8 years (ranging from 40-63 years). Mean time after surgery, of the post-operative photos used in the evaluation, was 10.3 months (range: 8.5-11.6) in group A and 10.9 months (range: 8.6-11.9) in group B. Average results for group A and B are presented in Figures III to VI, respectively.



Figure III. Average result after MACS-lifting (group A).

Pre- (A,C,E,G,I) and postoperative photographs (B,D,F,H,J). Patients' age was 42 years at the day of procedure, the post-operative photo was shot after seven months.

Results of the analysis of the pre- and postoperative photographs by the panel members are shown in Table I. Both the plastic surgeons (p=0.009) and medical students (p=0.01) panels found significant improvements in zone 1 (tear trough/ nasojugal groove) following surgery in Group B (MACS with lipofilling) patients. The nasolabial fold (zone 2) did not show any significant difference in improvement between groups A and B in the frontal view (surgeons: p=0.664; students; p=0.335). In this region, the three-quarter view showed significant improvement only according to the medical student panel (students: p=0.003; surgeons: p=0.10). Lipofilling of the malar eminence (in three quarter view) improved results significantly as rated by both panels (surgeons: p=0.001; students: p=0.007).

Tabel I

| Difference in standardized mean, and (<i>P-value</i>) group A vs. B | medical students | plastic surgeons |
|---|------------------|------------------|
| Frontal photo view | | |
| Zone 1 | 0,606 (0,009)* | 0,505 (0,010)* |
| Zone 2 | 0,101 (0,664) | 0,202 (0,335) |
| Three-quarter photo view | | |
| Zone 2 | 0,447 (0,100) | 0,591 (0,003)* |
| Zone 3 | 0,736 (0,001)* | 0,577 (0,007)* |

* Significant

Discussion

Optimal rejuvenating of the ageing face should involve repositioning of ptotic soft tissues as well as the correction of volume deficiency where present. Popularized by Coleman⁹, lipofilling is being increasingly used to augment soft tissues in aesthetic- and reconstructive plastic surgery¹⁹. The benefits of this technique include: a readily available source of permanent filler which is autologous, simultaneous body contouring in the process of fat harvesting, relative ease of execution^{20,21}, negligible morbidity, low costs and importantly, predictable and reliable results can be obtained. In addition, unlike synthetic fillers, autologous fat has the ability to change with the patient and adverse reactions are extremely uncommon. Local improvements in skin quality²² at graft location is another benefit of lipofilling and may add to a better postoperative result. Recent investigations on multipotent adipocyte derived stem cells may open up the possibility for thin patients to benefit from lipofilling also²³⁻²⁶.

In this study, statistically significant, lipofilling improved the tear trough and malar eminence. Surprisingly, filling of the nasolabial fold using a round tipped cannula did not yield consistent improvements. Previous studies on fat graft survival in the nasolabial crease have shown good results compared to other facial target zones^{5,27,28} attributable to the rich vascularisation of the maxillofacial region. Pontius et al reported that lipofilling in the nasolabial crease was an effective adjunct in midface lifting². Hypothesizing that our lack of effect might be a result from filling the nasolabial crease with a blunt cannula, we are currently investigating the value of pretreating this area with a sharper V-dissector instrument.



Figure IV. Average result after MACS-lifting and lipofilling (group B).

Pre- (A,C,E,G,I) and postoperative photographs (B,D,F,H,J). Patients' age was 60 years at the day of procedure, the post-operative photo was shot after six months.

Despite the increasing number of favorable aesthetic outcomes seen following lipofilling in the literature⁴, the technique is still often plagued with uncertainties about its longevity and the unpredictability of the survival of the fat cells^{21,29}. Though post-operative graft atrophy has been reported elsewhere^{29,30}, in this study no need for secondary lipofilling was observed during the period of investigation. Authors believe that centrifugation before injection improves reproducibility and allows for better quantification of volumes needed for injection. Most authors would agree that the viability of the fat cells is affected by the manner by which the cells are harvested and processed^{9,31-38}, the rapidity and degree of revascularization of

the transplanted fat cells^{21,26,39} and the degree of fibrosis in the transplanted area^{21,29,34,40,41}. The follow-up period of 10.3 months in group A and 10.9 months in group B was found to be sufficient by the authors. Recent studies about fat cell survival^{134,42,43} suggest that major changes in volume after 6 months are highly unlikely due to the degree of cell organization^{34,43} and deep vascularisation^{34,43,44} of the graft. Authors concur with Kaufman et al. for further objectifying graft survival in humans with modern volumetric imaging technology.

The use of autologous angiogenesis promoters such as autologous growth hormones derived from platelets (PDGF)⁴⁵, vascular endothelial growth factor (VEGF)^{39,46}, hypoxia-inducible factor 1 (HIF-1)^{29,47}, and insulin-like growth factor (IGF-1)^{48,49} have shown to be promising in their ability to improve the viability of the fat grafts⁴⁴. These factors are released by platelets⁵⁰, which can be added to the fat graft in the form of platelet rich plasma (PRP). It is possible that these new developments will improve short and long-term results with lipotransfer by accelerating vascular ingrowth^{43,51}.

In this non-randomized retrospective study, all patients with loss of volume as a clear part of their ageing process were offered the option of adding lipofilling to MACS-lifting, during the first consultation. One could argue that results in this group were better due to the worsening pre-operative state (evident loss of volume). However in most cases, this loss will be more subtle and not as evident, but will still be a major contributing factor to the patients facial age. In the MACS lift only group, no doubt, there will be patients that would have had benefit from lipofilling also. We believe that in a larger group of patients than anticipated up to now, lipofilling will improve results. Defatta et al. drew similar conclusions in their study⁵².

This study, evaluating the objective aesthetic outcome in patients undergoing MACS lifting with or without lipofilling, demonstrates that lipofilling enhances aesthetic outcome of MACS-lifting for facial rejuvenation significantly.

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